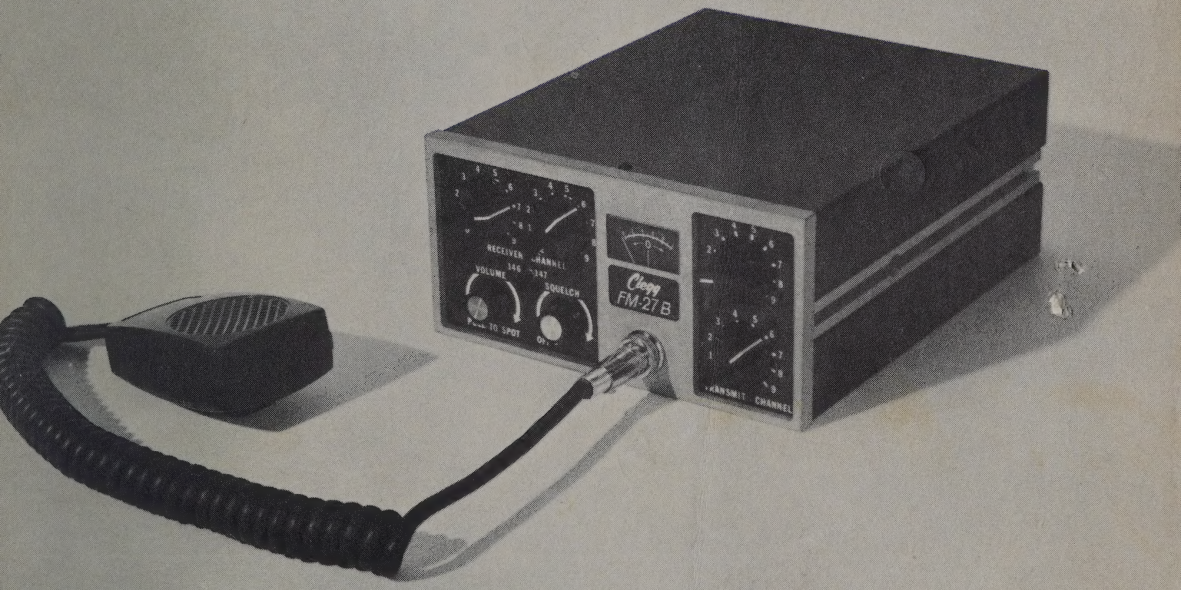
SRNO. 27103-2793

FM-27 B

OWNER'S MANUAL



SIGNAL AND CONTROL
INTERNATIONAL
CORPORATION

Clegg DIVISION

3050 Hempland Road
Lancaster, Pennsylvania 17601

WARRANTY

Clegg Transceivers are sold with a 90 day warranty, which guarantees the unit to be free from defects in material and workmanship. International Signal and Control Corp., Clegg Div., agrees to repair or replace, without charge, all parts showing such defects when said transceiver is delivered to our factory intact for our examination within 90 days from the date of sale to the original purchaser.

This warranty does not cover transceivers subjected to misuse, neglect, tampering, improper installation, or units with serial numbers removed or altered.

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Purchased From L. M. COMMUNIC.

Date Purchased 4-10-74

FM-27 Serial Number 27024 - 3665

MOBILOK Key Number BPW-5

INTRODUCTION

During the past 3 years, FM operation on the 2 meter band has blossomed to an almost uncontrolled dimension. For many years before, the only rigs available were the surplus and commercial units, most likely from a taxi-cab company or a local governmental agency. Then in 1968 the advent of the first amateur commercial unit spurred a few more Hams into joining the 2 meter FM ranks. As FM on the 2 meter band began to catch on, more and more companies added their units to the growing line of 2 meter FM crystal controlled transceivers. Until this time only Clegg had offered a unit, Model 22'er FM, that was able to tune across the entire 2 meter band.

Now with Clegg's newest addition, the FM-27B, the amateur radio operator has a whole new realm at his fingertips. The exclusive crystiplexer allows you to simply dial up your own frequency. Besides having over 25 watts at the antenna terminal, you are now released of the burden and EXPENSE of continually buying crystals.

DESCRIPTION

The FM-27B provides the 2 Meter FM'er with a completely new concept in Transceivers. It features *Crystiplexer* synthesis of both receiver and transmitter frequency, combined with sensitivity and power output destined to set new standards for the band.

Rugged construction is evidenced by separate transmitter and receiver sections built on G-10 glass epoxy circuit board. A sturdy Die cast aluminum front panel, extruded structural members, and formed aluminum top and bottom covers, surround all components protecting them from damage. The entire unit weighs a mere 4.62 lbs.

Fully transistorized circuitry utilizing the latest 'State of the Art' design assures complete operating dependability and top performance. The extensive use of integrated circuits achieves optimum space reduction.

Receiver design makes extensive use of recently developed passive components and MOSFET devices in addition to the latest integrated circuits and voltage variable capacitors. Receiver sensitivity and selectivity equals or exceeds that of all currently available 2 meter ham transceivers. The receiver provides continuous coverage from 146 to 148 MHz. (Different 1 MHz segments can be covered by substitution of one or more internal crystals and minor realignments). Receiver tuning is accomplished by three panel controls:

(1) MHz Selector (146–147); a 2 position toggle switch
(2) 100 KHz Selector; a 10 position rotary switch
(3) 10 KHz Tune; a 300° potentiometer

Transmitter frequency control is accomplished in the same manner as that of receiver. The transmitter produces a minimum of 25 watts output of cleanly modulated FM (to EIA standards) with internally adjustable deviation and speech clipping. The RF output stage has inherent protection against damage from excessive VSWR loads.

Frequency stability of both transmitter and receiver is comparable with that of typical high quality crystal controlled 2 Meter FM transceivers. Resetability to any specific channel is more than adequate for accessing repeaters.

GUARANTEED PERFORMANCE SPECIFICATIONS

GENERAL

Voltage Requirements	12–14 VDC
Current Consumption	Standby .4A
	Receive 1.2A
	Transmit 6A MAX
Dimensions	$7\frac{3}{8}$" X $3\frac{1}{2}$" X $9\frac{1}{4}$" Deep
Weight	4.62 lbs.
Metering	Receive: Discriminator, Zero Center. Approx. ±5 KHz for 30% deflection
	Transmit: Relative Output, Automatically switched with T/R logic

RECEIVER

Tuning Range	146.00 to 147.99 MHz, continuously tuneable with reset capability of less than 1 KHz to any frequency in this range.
Tuning Controls	3 controls; switch selection 146 or 147 MHz range, and 2 bar knobs select desired channel in digital fashion.
Stability	± .001% from 40° to 100°F ± .0025% from –10 to 120°F

Sensitivity	.35 uv max. for 20 dB quieting; .1 uv for reliable squelch action
Selectivity	11 KHz at 3 db; less than 30 KHz at 70 db. Adjacent (30 KHz spaced) channel rejection more than 70 db
Spurious & Image Rejection	Down by more than 60 db
Modulation Acceptance	± 8 KHz
Audio Output	2 watts (min) at less than 10% THD into 3.2 ohm speaker

TRANSMITTER

Tuning Range & Controls	Same as RECEIVER
Power Output	25 watts min. into 50 ohm load. P/A transistor protected for infinite VSWR.
Modulation	Phase Modulated, pre-emphasis per EIA standards. Internally adjustable up to 10 KHz deviation and up to 12 db peak clipping.
Output Spectrum	All non-harmonic spurious outputs down more than 40 db.
Transmit Control & Microphones	Push to talk, Noise cancelling, PTT, Ceramic microphone supplied.

INSTALLATION

Power Source and Connector

The FM-27B requires a reasonably stiff source of 12.5 to 14.0 volts. Source resistance should not exceed .1 ohm. The typical automotive battery system represents an excellent source if proper care is exercised in the wiring between the battery and the transceiver. While the cigarette lighter receptacle may be adequately wired in some cars to provide suitably low source resistance this type of installation is *not recommended except for emergency or temporary use.* Connecting directly to the battery terminals is important for alternator whine elimination. Typically, a pair of stranded #14 wires with a total conductor length of less than 30 feet (15' pair) between the battery terminals and the transceiver power plus is recommended.

The FM-27B is delivered with a polarized two pole connector. In wiring this connector, it is imperative that polarity be observed. The WIDER OF THE TWO CONNECTOR PRONGS IS THE POSITIVE POLE. THE VEHICLE MUST EMPLOY THE CONVENTIONAL NEGATIVE GROUND SYSTEM.

While the FM-27B has been designed principally for mobile operation, the unit can also make an ideal base station when used in conjunction with a suitable 12.5 to 14.0 Volt D.C. Power Supply. Design of such a supply should be such that reasonable regulation and a 6 Ampere current requirement can be met. Voltage under the low current (250–300 Ma) receive condition must not exceed 14.5 volts. Voltage under the 5–6½ Ampere transmit condition should not drop below 13 volts. For full specification performance, voltage should not change more than .75 volts when switching from receive to transmit. The FM-27 accessory Power Supply meets these specifications.

The FM-27B has been designed to work into a 50 ohm coaxial load with less than 2:1 VSWR. The final amplifier is inherently protected for momentary mismatches such as occur in adjusting an antenna or accidentally operating with antenna disconnected. PERMANENT DAMAGE TO THE POWER AMPLIFIER CAN RESULT FROM PROLONGED TRANSMITTER OPERATION INTO SERIOUSLY MISMATCHED ANTENNA SYSTEMS.

To assure obtaining maximum performance from the FM-27B Receiver and Transmitter, a good antenna must be provided. Many excellent mobile and base station antennae are available to the ham. Those which provide gain are recommended where practical. Equally important, particularly in base stations where transceiver and antenna may be separated by considerable distance, is the use of a low loss coaxial cable. In mobile installation it may not be practical to use larger than RG-58 cable. Good RG-58/U has a loss of almost 1 db in lengths common to mobile installations. RG-8A/U has less than half this loss. Inferior grades or old weathered cables may have losses considerably greater than that of new quality grade cables.

Mobile Mounting

The FM-27 is provided with a unique mobile mounting bracket. This device not only provides considerable flexibility in mounting position and location, but contains a lock and key system to permit a virtually theft proof installation.

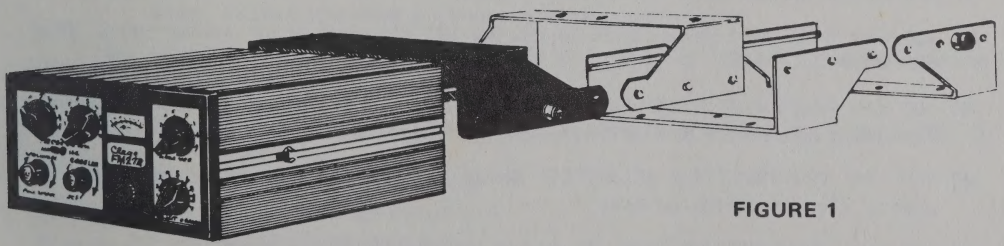


FIGURE 1

Figure 1 shows a number of manners in which the versatile MOBILOK can be positioned. A drilling template for installation is included with the mounting bracket.

Where the FM-27B is to be moved back and forth between several cars, additional MOBILOK brackets can be purchased from Clegg Dealers or directly from the factory. The price is $19.95.

It is suggested that you record the key number in the space provided on the title page of this manual.

Replacement keys can be provided by written request for properly registered FM-27A's but only when the serial numbers for both the radio and the key are included in the request. Price of a pair of replacement keys is $1.75 including postage and handling. Allow 2 weeks for delivery.

OPERATION

Control Functions

The FM-27B has 7 front panel controls; See Figure *2*

(1) VOLUME AND SPOT CONTROL. This control is a conventional volume adjustment. Ganged with this control is a PULL-PUSH action switch which actuates the low level stages of the transmitter for frequency spotting and modulation monitoring purposes.

(2) SQUELCH and POWER control. When this control is completely counter-clockwise the 12 VDC power is switched off. When advanced clockwise, the SQUELCH sensitivity is decreased. That is, a stronger signal is required to actuate the receiver when fully clockwise than when set below this level.

(3) MHz SELECTOR. This 2 position toggle switch selects either of the 2 MHz segments (146 and 147 MHz) that the FM-27B receiver will tune. This switch will also select the transmit segment when the modification kit has been installed.

(4) 100 KHz RECEIVER SELECTOR. Selects the 100 KHz segment for receiver tuning. (For 52– set to 5).

(5) 100 KHz RECEIVER TUNE. Tunes over the 100 KHz range selected by the above control. The scale is calibrated in 10 KHz increments. (For 52–set to 2).

(6) 100 KHz TRANSMITTER SELECTOR. Selects the 100 KHz segment for transmitter frequency. (To transmit 52–set to 5).

(7) 100 KHz TRANSMITTER TUNE. Tunes over the selected 100 KHz range. (For 52–set to 2).

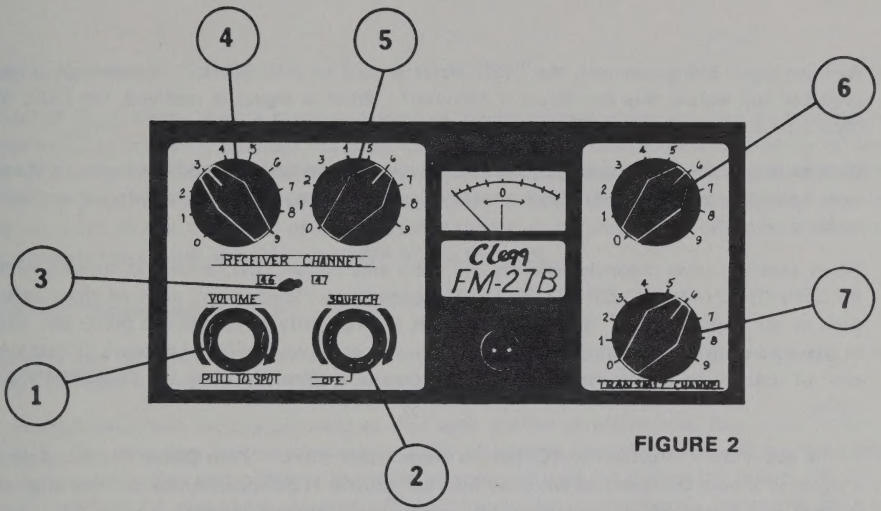


FIGURE 2

Receiver Operation

IT IS RECOMMENDED THAT THE OWNER FAMILIARIZE HIMSELF WITH THE RECEIVER AND CRYSTIPLEXER OPERATION BEFORE CONNECTING THE MICROPHONE AND INADVERTENTLY (OR INTENTIONALLY) ACTIVATING THE TRANSMITTER.

(1) Actuate power to receiver by advancing SQUELCH control clockwise just past the switch detent. Observe that panel and meter illumination is activated.

(2) Adjust VOLUME to a comfortable noise level. Knob on VOLUME Control should be in the "PUSHED IN" position.

(3) Select a frequency on which signals would be likely to be received—for instance "52" (146.52) MHz) in most areas.

a) Set MHz Selector Switch to 146
b) Set 100 KHz Selector Switch to 5
c) Set 100 KHz Tune Control to 2

(4) With no signal being received, the DISC Meter should be MID-SCALE (An internal control is available for setting this condition if required). When a signal is received, the DISC Meter should be set to MID-SCALE with the 100 KHz tune control.

(5) With no signal being received, the SQUELCH control can be advanced clockwise to the point where audio is just silenced. At this setting a signal as weak as .1 microvolt will activate the audio.

(6) When several active channels exist in the users area he can best familiarize himself with the RECEIVER CHANNEL CRYSTIPLEXER controls by "dialing-up" each of these channels such as the popular "76," "82," "88," etc. It will normally be possible to preset any channel in the absence of a signal and have negligible tuning error when a signal appears. Exact tuning, can, of course, be accomplished in the presence of a signal by using the DISCRIMINATOR meter.

(7) In the event the DISCRIMINATOR Meter reads either side of "Zero Center" in the absence of a signal it should be rezeroed with the internal control R *53* located near the rear edge of the receiver P/C Board which may be readily accessed by removing the botton cover from the FM-27B. See Figure *3*

Transmitter Operation

(1) CRYSTIPLEXER—The CRYSTIPLEXER TRANSMIT CHANNEL controls the FM-27B and, of course identical in operation to those of the receiver.

(2) *Spot and Monitor*—provisions contained in the FM-27B perform as follows:

a) When the VOLUME control knob is pulled out from its normal position, the low level and modulator stages of the transmitter are actuated; the antenna change-over relay is deactivated and the receiver is unaffected. Consequently, it is possible to listen to ones own signal and ascertain that the transmitter is on frequency. This step is important when using a Narrow Band Repeater. When the Push to Talk button is depressed on the microphone, the operator can observe his own modulation quality. *No signal is radiated since the SPOT switch has deactivated the T/R relay.*

Relative Output Meter

The FM-27B Panel Meter reads a rectified sample of the RF voltage across the antenna terminal when transmitting. The metering function has been factory adjusted so that a reading between 60 and 80 percent of full scale represents an output voltage equivalent to 25 watts on a matched resistive 50 ohm load. This approximate level of meter deflection should be obtained. A significantly higher or lower reading will normally be indicative of a mismatched load and the antenna VSWR should be checked and appropriate steps taken to achieve a VSWR of less than 1.5.

Deviation and Clipping Adjustments

The FM-27B has two internal controls which affect transmitter modulation. One of these, ***R 77* is the DEVIATION ADJ; the other, **R 72* is the CLIPPING control.

These controls have been factory adjusted so that with normal conversational levels, the transmitter will have 5 KHz deviation and approximately 3 db of average peak clipping. Where the operator speaks in a louder voice and achieves excessive clipping, it may be desired to retard **R 72*. No adjustment of ***R 77* should be required. The operator can approximately determine the correct CLIPPING and DEVIATION settings, using the MONITOR provision described above.

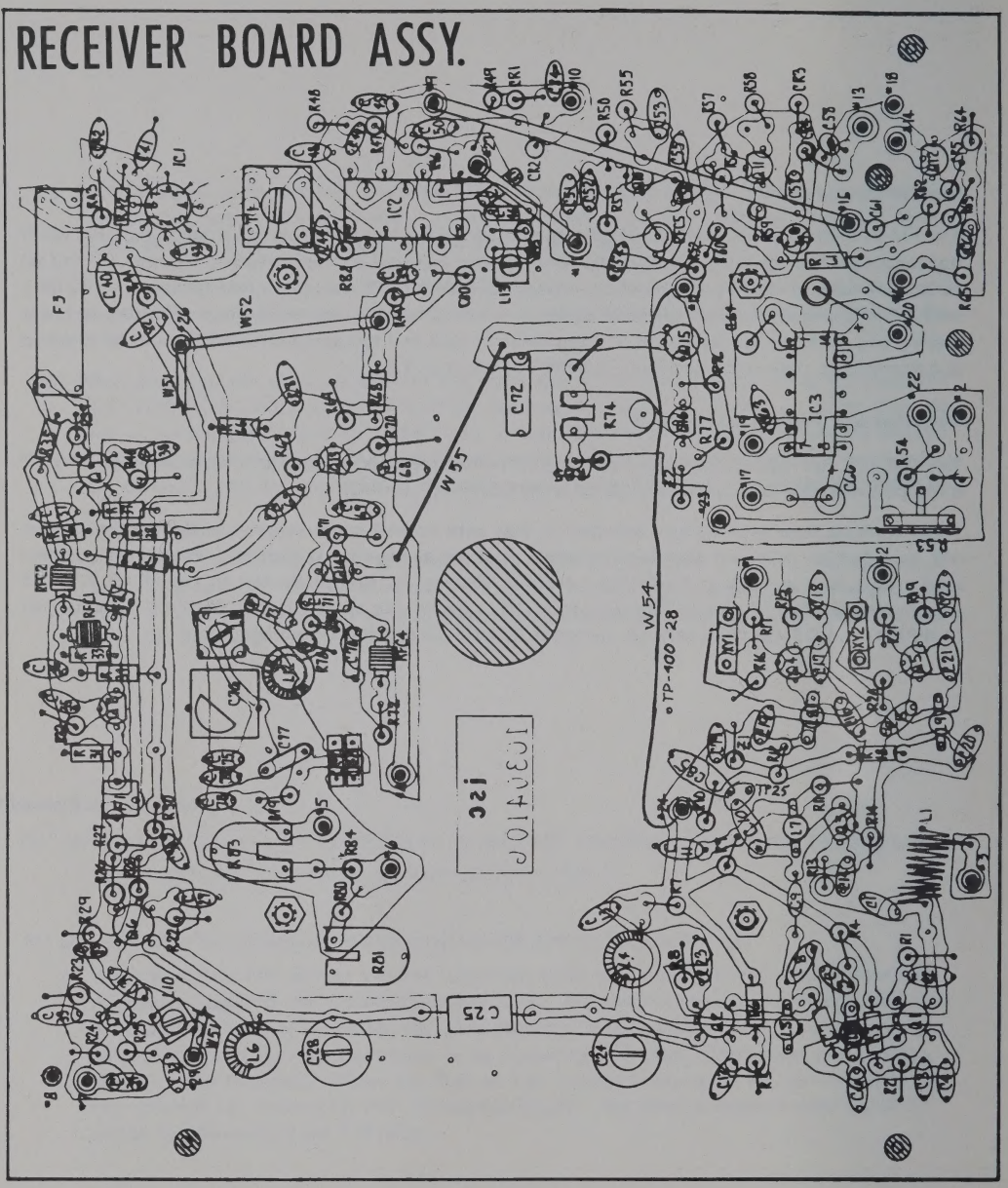

RECEIVER BOARD ASSY.
W54
TP-100-28
W55
W52
W51
FJ
IC1
IC2
IC3
C25
C28
L6
L1

FIGURE 3

TRANSMITTER BOARD ASSY.

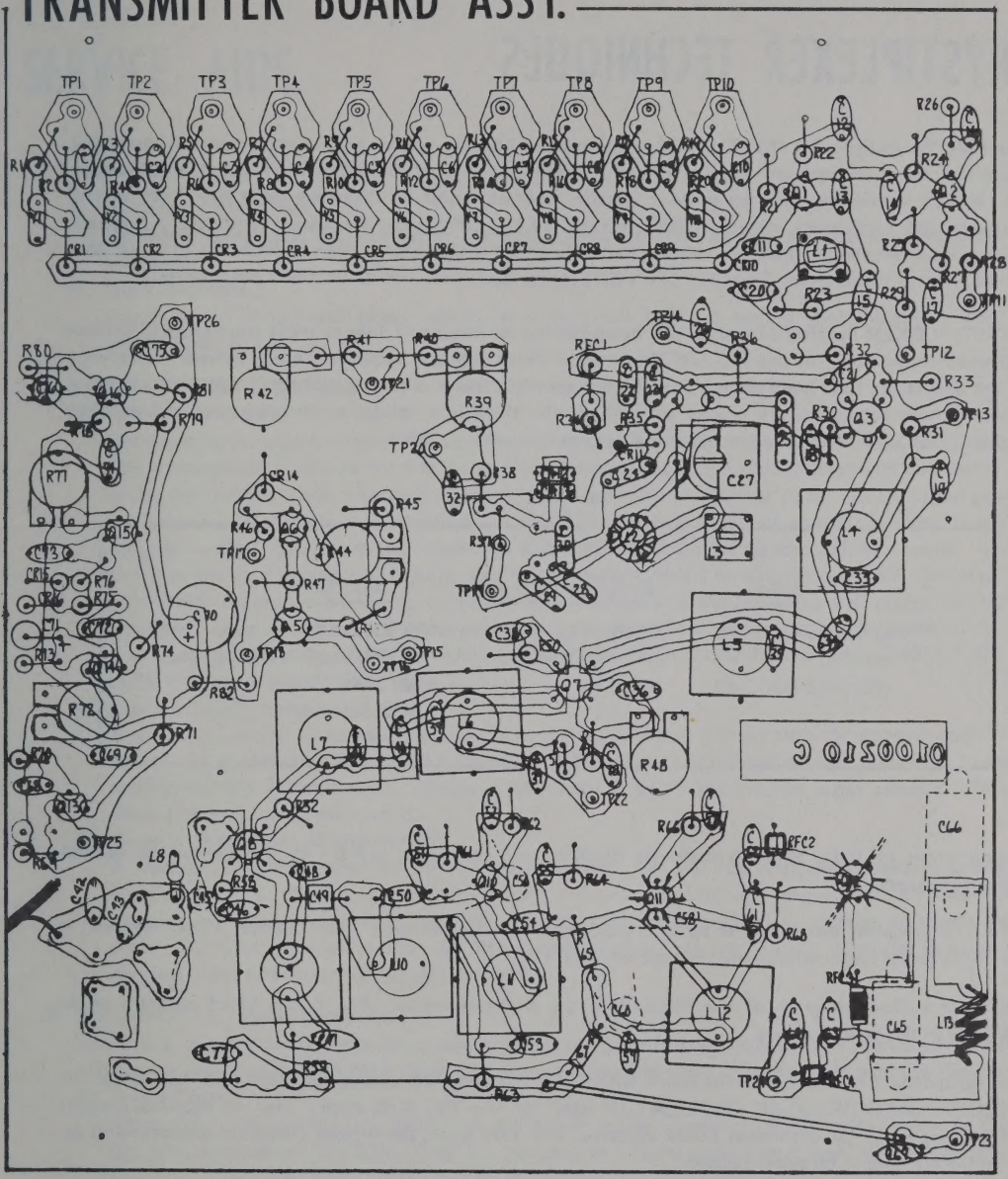


FIGURE 4

CRYSTIPLEXER TECHNIQUES

The FM-27B utilizes CRYSTIPLEXER technique to control both transmit and receive frequencies. While the circuit arrangement particularly with regard to the receiver application is quite conventional, the physical implementation to provide decade readout is unique. Whereas there have been several relatively new techniques utilizing digital technology to perform the frequency synthesis. At present there are numerous performance reliable and economic limitations to their application in a self contained 2 meter transceiver. The CRYSTIPLEXER approach does not suffer these limitations.

CRYSTIPLEXER synthesis involves the hetrodyining or mixing of two or more oscillators to achieve a desired frequency. In the FM-27B Transmitter three separate oscillators are involved. Frequency of the oscillators have been chosen to minimize spurious mixer products and attain optimum stability. Two of these oscillators are crystal controlled: the third is a voltage controlled variable frequency oscillator (VCO). These oscillator nominal frequencies are:

Unit	Frequency Range	Function
a/ Crystal Osc. #1	25.55 to 26.45 MHz	100 KHz steps
b/ VCO	4.45 to 4.55 MHz	100 KHz steps & Modulation
c/Crystal OSC. #2	116 MHz	Final Freq. Conversion & MHz Selection

Examination of these three frequencies disclose that their sum (a + b + c) is equal to the desired output frequency.

The 27B Receiver employs the same crystal oscillator frequencies. The receiver VCO, however, is 455 KHz lower to accommodate the receiver final IF.

Fig. 5 is a block diagram of the FM-27B in the transmit mode. Fig. 6 is a block diagram of the FM-27B in the receive mode.

Not portrayed (for clarity) in the block diagram is the common useage (transmit and receive) of the PROGRAMMED CRYSTAL OSCILLATOR used for the 100 KHz steps. The ten separate crystals are accompanied by individual diode switches and T/R logic, permitting unrelated transmit and receive frequencies to be programmed.

SERVICE AIDS

I INTRODUCTION

A. *Equipment Required*

RF Signal Generator, AC Voltmeter, RF Power Meter, Frequency Meter, Deviation Meter, DC Voltmeter

B. *Tools Required*

Screw driver, long nose pliers, soldering iron, small flathead tuning tool (Motorola Part #66A82186E01).

II RECEIVER PERFORMANCE

A. *Quieting Sensitivity*

The quieting sensitivity is that RF signal level necessary to reduce the audio output by 20 db. This measurement requires the use of an RF signal generator and an AC voltmeter connected across the speaker leads. An audio output jack is available on the rear panel. Connect the signal generator to the antenna terminal of the 27B. With a signal of at least one microvolt into the receive, insure that the receiver is tuned to Mid-Scale on the discriminator meter. Be sure that the squelch control is fully counterclockwise without turning the radio off. Decrease the signal generator to minimum output. Adjust the volume control for a +10 db on the AC voltmeter. Increase the output signal generator until the AC voltmeter reading decreases 20 db, or a reading of –10 db. THE AMOUNT OF SIGNAL REQUIRED TO DO THIS SHOULD BE LESS THAN .35 MICROVOLTS.

B. *Squelch Sensitivity*

Squelch sensitivity is measured in the same manner as above except that the squelch control will be set at threshold instead of fully counterclockwise. It is not necessary to obtain a 20 db reading on the AC voltmeter. Instead, find the RF signal required to break squelch. This should be less than .2 microvolts.

C. *Receiver Frequency Measurements*

A frequency meter is required for this measurement. Set the 100 KHz select control to any position and the 100 KHz tune control to five. Inject a signal for this frequency. The discriminator meter should not read greater than one division off of mid-scale. Repeat this check on every 100 KHz position of the 100 KHz select control. If the reading is greater than one division, refer to Section IV for adjustments.

III TRANSMITTER PERFORMANCE

Insure that the 27B is connected to a power source sufficiently rated to supply at least 6 amps and sufficient regulation so that the voltage will not increase more than .75 volt when going to receive.

A. *Power Output*

Equipment required for this check is an RF power meter. Connect the RF power meter to the antenna terminals of the 27B. Key the transmitter. There should be at least 25 watts on any frequency within the 146 to 148 MHz band.

B. *Deviation Level*

Equipment required for this check is a deviation meter. Insure that the 27B is connected to a proper load when transmitting. Key the transmitter and speak in a normal voice level. The deviation should average 5 KHz. Advance R83 for more deviation. With the maximum deviation set you may control the amount of clipping with R94.

C. *Transmitter Frequency Measurements*

Provided that the receiver is calibrated within tolerance, you may make this measurement using the spot function. Otherwise it will be required to transmit a signal and read the frequency on the frequency meter. With the 100 KHz select switch in any position tune the 100 KHz tune control to five. Tune the receiver 100 KHz tune also to five. The discriminator meter should be within one division of mid-scale. Repeat this check at zero and nine. If the reading is greater than one division refer to section IV for adjustments.

IV RECEIVER AND TRANSMITTER FREQUENCY ADJUSTMENT

A. *Receiver*

The equipment required for this adjustment will be a frequency meter, tuning tools, and an accurate DC voltmeter. Adjust the voltage limits first. Connect the DC voltmeter to TP 400-5. Set the receiver 100 khz tune control to nine. Adjust R64 for 6.40 volts. Turn the 100 khz control to zero. Adjust R81 for 4.40 volts. With the voltage limits set, coil L11 and capacitor C76 should be adjusted to cover the zero to nine range. It is necessary to add inductance and remove capacitance when there is not sufficient spread. Conversely, it is necessary to remove inductance and add capacitance when the frequency spread overlaps zero and nine. Once the ends are set, resistor R83 may be varied so as to provide a closer calibration on all mid-range positions. This control will affect the end points. Readjust R64 for 6.40 volts and R81 for 4.40 volts. It will not be necessary to readjust L11 or C76.

B. *Transmitter*

Provided that the receiver is calibrated within tolerance, you may make this adjustment using the spot function. Otherwise it will be required to transmit a signal and read the frequency on the frequency meter. Adjust the voltage limits first. Connect the DC voltmeter to TP-20. Set the receiver 100 KHz tune control to nine. Adjust R44 for 6.40 volts. Turn the 100 khz tune control to zero. Adjust R48 for 4.40 volts. With the voltage limits set, coil L3 and capacitor C27 should be adjusted to cover the zero to nine range. It is necessary to add inductance and remove capacitance when there is not sufficient spread. Conversely, it is necessary to remove inductance and add capacitance when the frequency spread overlaps zero and nine. Once the ends are set, resistor R39 may be varied so as to provide a closer calibration on all mid-range positions. This control will affect the end points. Readjust R44 for 6.40 volts and R48 for 4.40. It will not be necessary to readjust L3 or C27.

PC BOARD REMOVAL

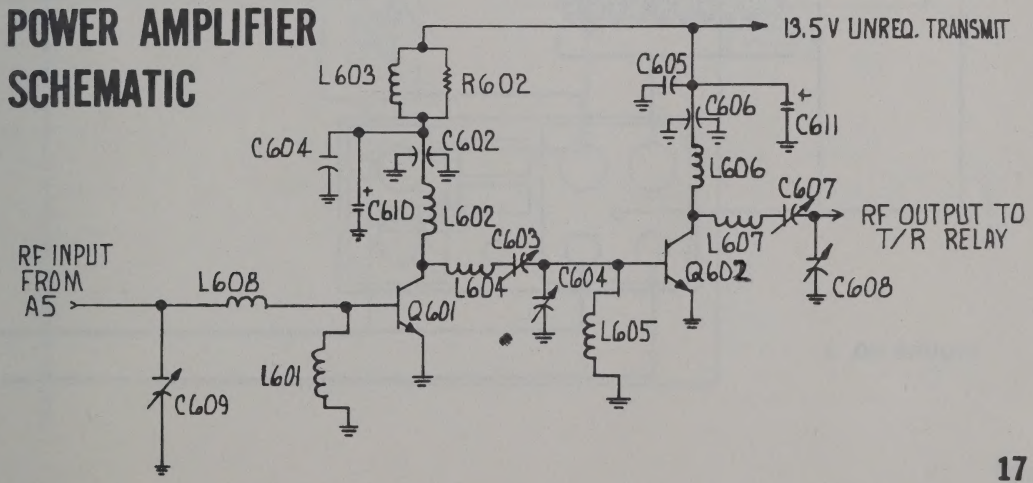
In most cases, removal of the receiver board will enable you to gain access to both the receiver and the transmitter board. This may be accomplished by removing the four 6-32 screws securing the receiver board to the rails and lifting the board out. Naturally, the board will not come out farther than the harness allows but this is usually enough to allow component replacement on either board.

TROUBLE SHOOTING AIDS

The 27B consists of 5 basic oscillators. When trouble shooting a receiver or transmit failure, a quick check of all these oscillators in most cases will render the problem found. In the receiver there is a 116 MHz or 117 MHz first oscillator. There is also injection from the transmitter board which varies from 25.55 Mhz to 26.45 Mhz. And there is the VCO which operated from 4450 KHz to 4540 KHz. Using a frequency counter of average sensitivity and the small 1/2" loop on the end of the test lead, you should be able to read 116 or 117 Mhz at coil L7, transistor Q3, and its associated circuitry. The 25 Mhz can be measured at coil L10, transistor Q7, and its associated circuitry. The VCO can be measured at Q13 and its associated circuitry.

In the transmitter there is a 116 or 117 Mhz oscillator. There is also a crystal oscillator with 10 associated crystals varying in frequency from 25.55 (associated to zero position) to 26.45 (associated with nine) in 100 khz steps. The VCO operates from 4450 to 4540 khz. You can measure the 116 or 117 mhz at coil L8, transistor Q9, and its associated circuitry. The 25 Mhz oscillator can be measured at coil L1, transistor Q1, and its associated circuitry. Resistor R48 is a drive level adjustment and affects the 30 to 31 mhz and 116 mixing process.

POWER AMPLIFIER SCHEMATIC



RECEIVE BLOCK DIAGRAM

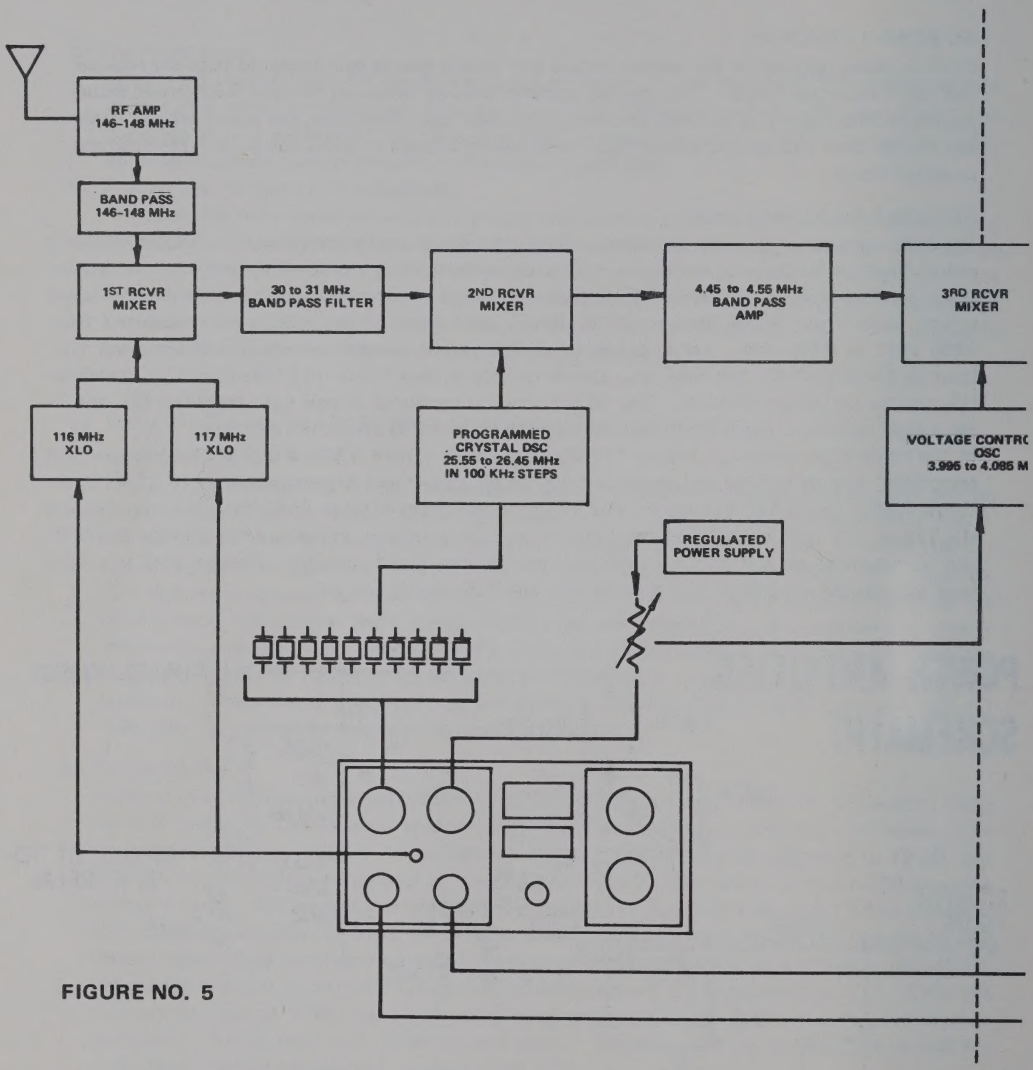
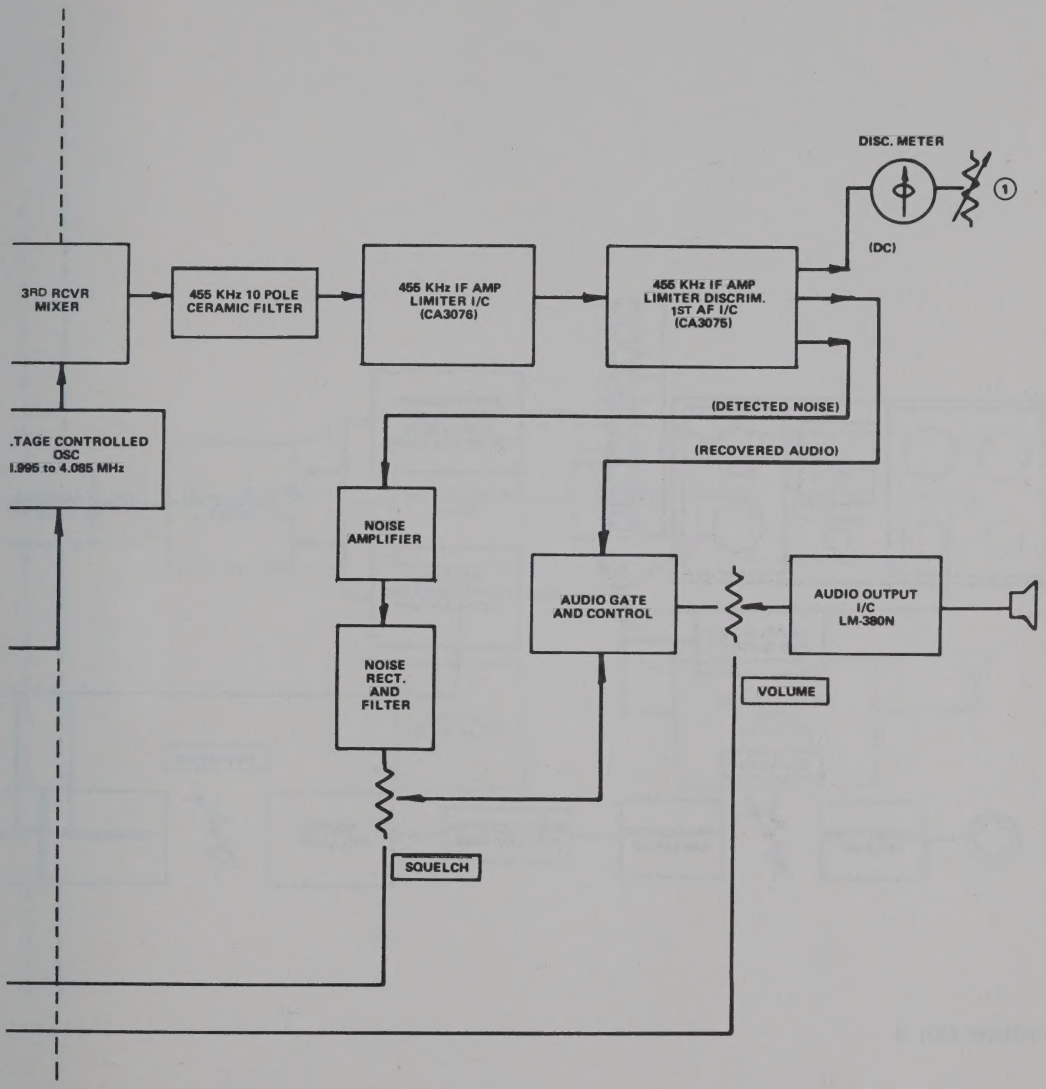


FIGURE NO. 5


DISC. METER
1
(DC)
3RD RCVR MIXER
455 KHz 10 POLE CERAMIC FILTER
455 KHz IF AMP LIMITER I/C (CA3076)
455 KHz IF AMP LIMITER DISCRIM. 1ST AF I/C (CA3075)
(DETECTED NOISE)
(RECOVERED AUDIO)
.TAGE CONTROLLED OSC
1.995 to 4.085 MHz
NOISE AMPLIFIER
AUDIO GATE AND CONTROL
AUDIO OUTPUT I/C LM-380N
NOISE RECT. AND FILTER
VOLUME
SQUELCH

TRANSMIT BLOCK DIAGRAM

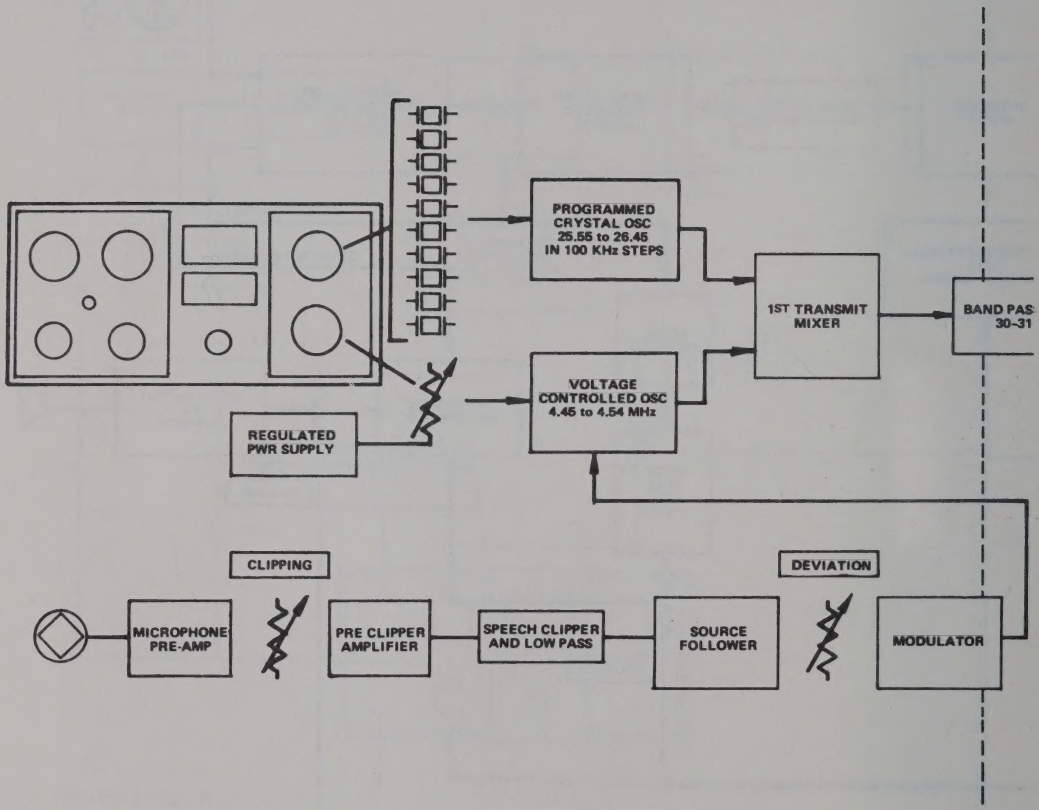
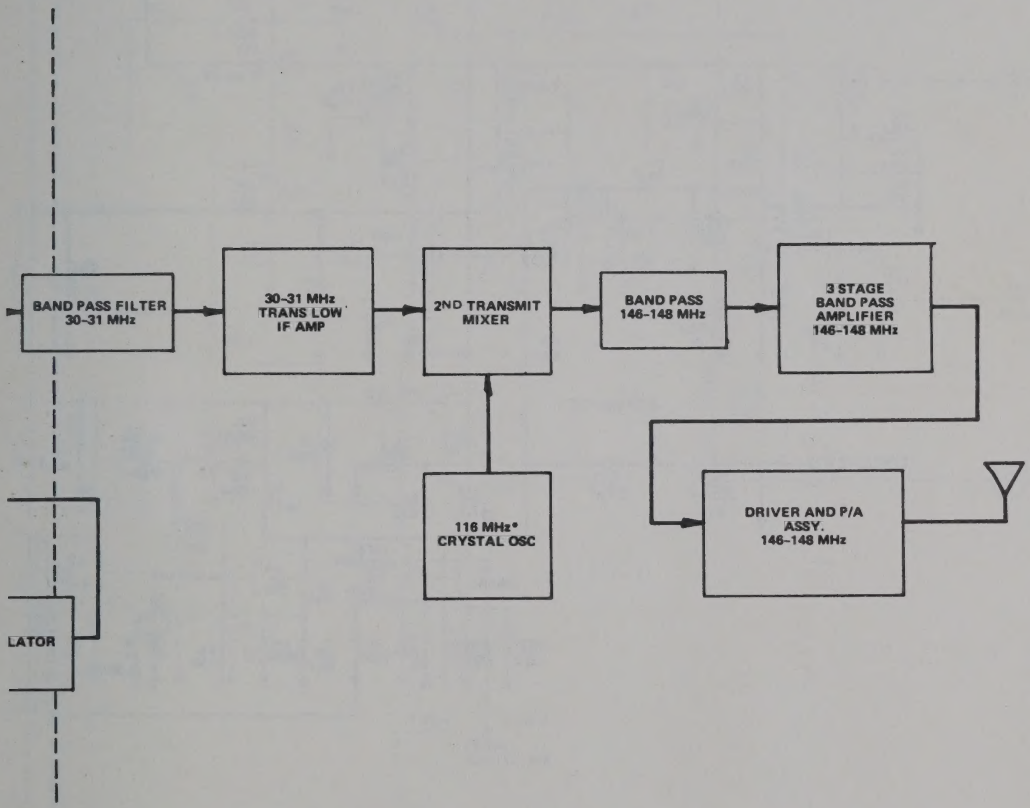


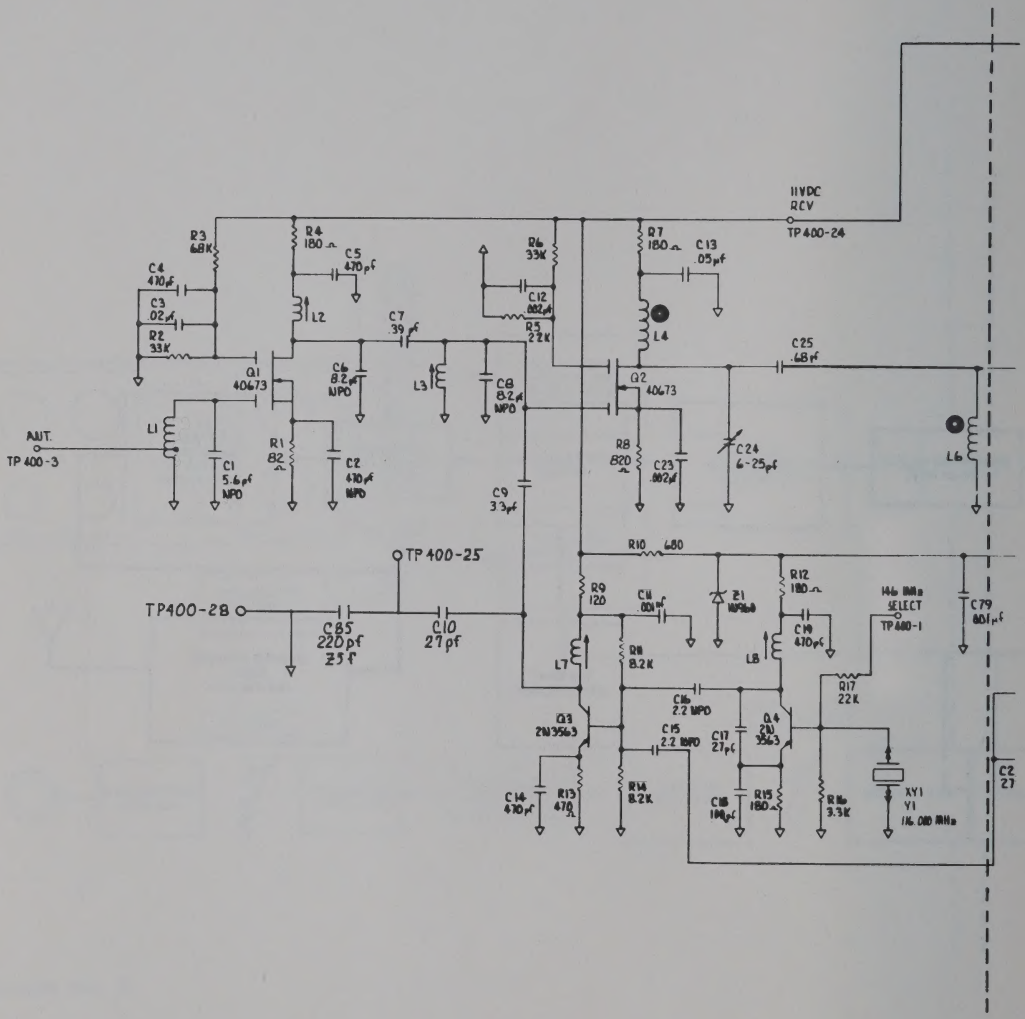
FIGURE NO. 6

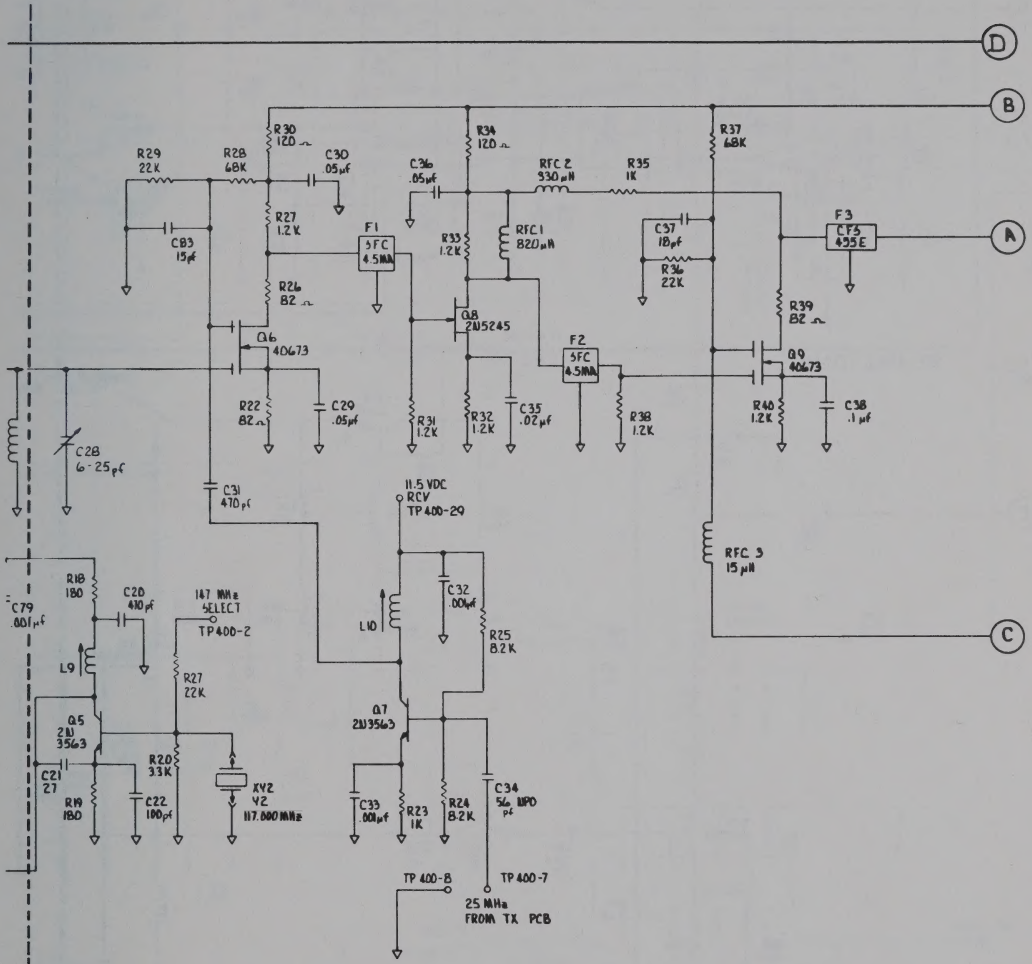

BAND PASS FILTER
30-31 MHz
30-31 MHz
TRANS LOW
IF AMP
2ND TRANSMIT
MIXER
BAND PASS
146-148 MHz
3 STAGE
BAND PASS
AMPLIFIER
146-148 MHz
116 MHz*
CRYSTAL OSC
DRIVER AND P/A
ASSY.
146-148 MHz
LATOR

RECEIVER BOARD ASSY. SCHEMATIC

FIGURE NO. 7

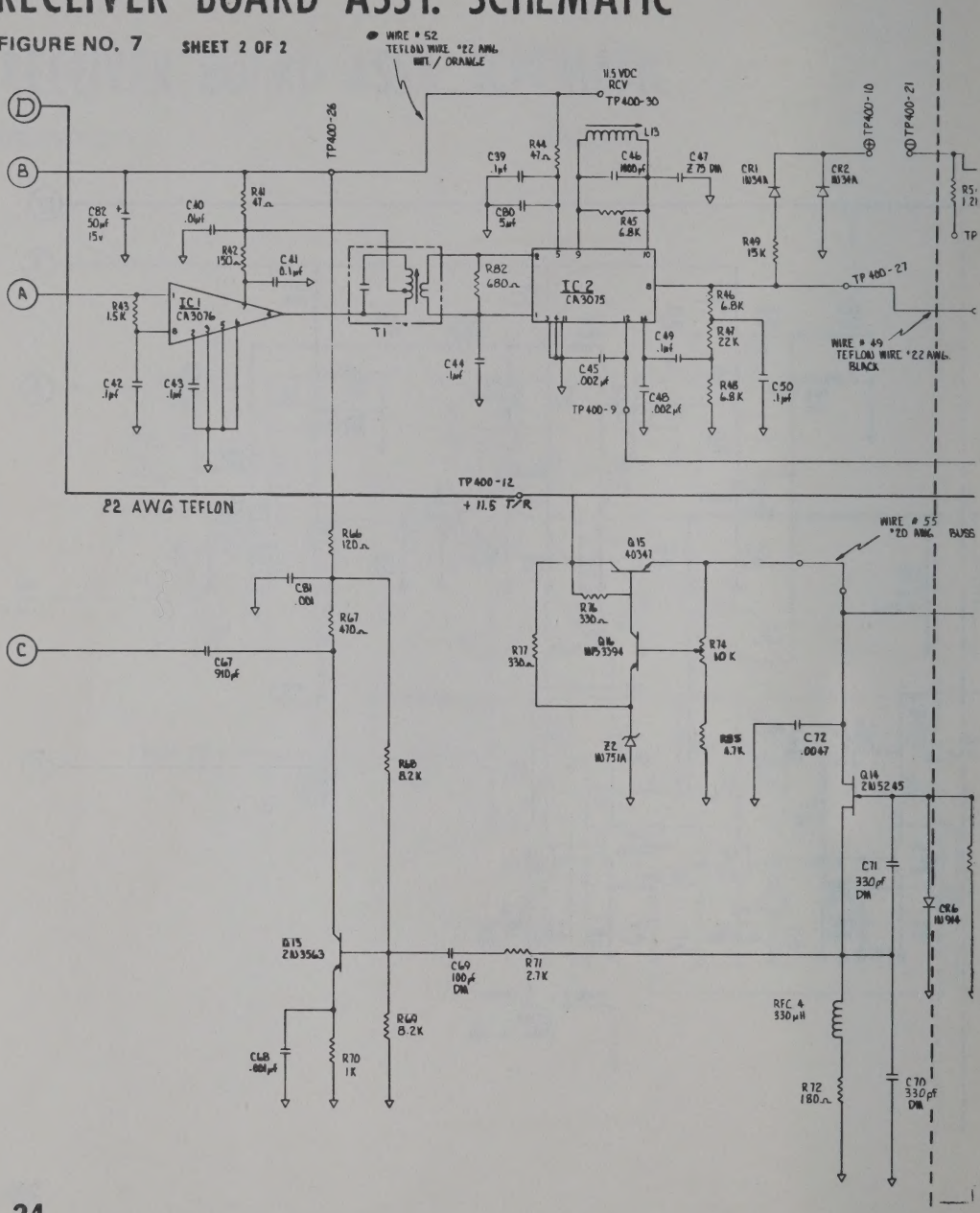
SHEET 1 OF 2

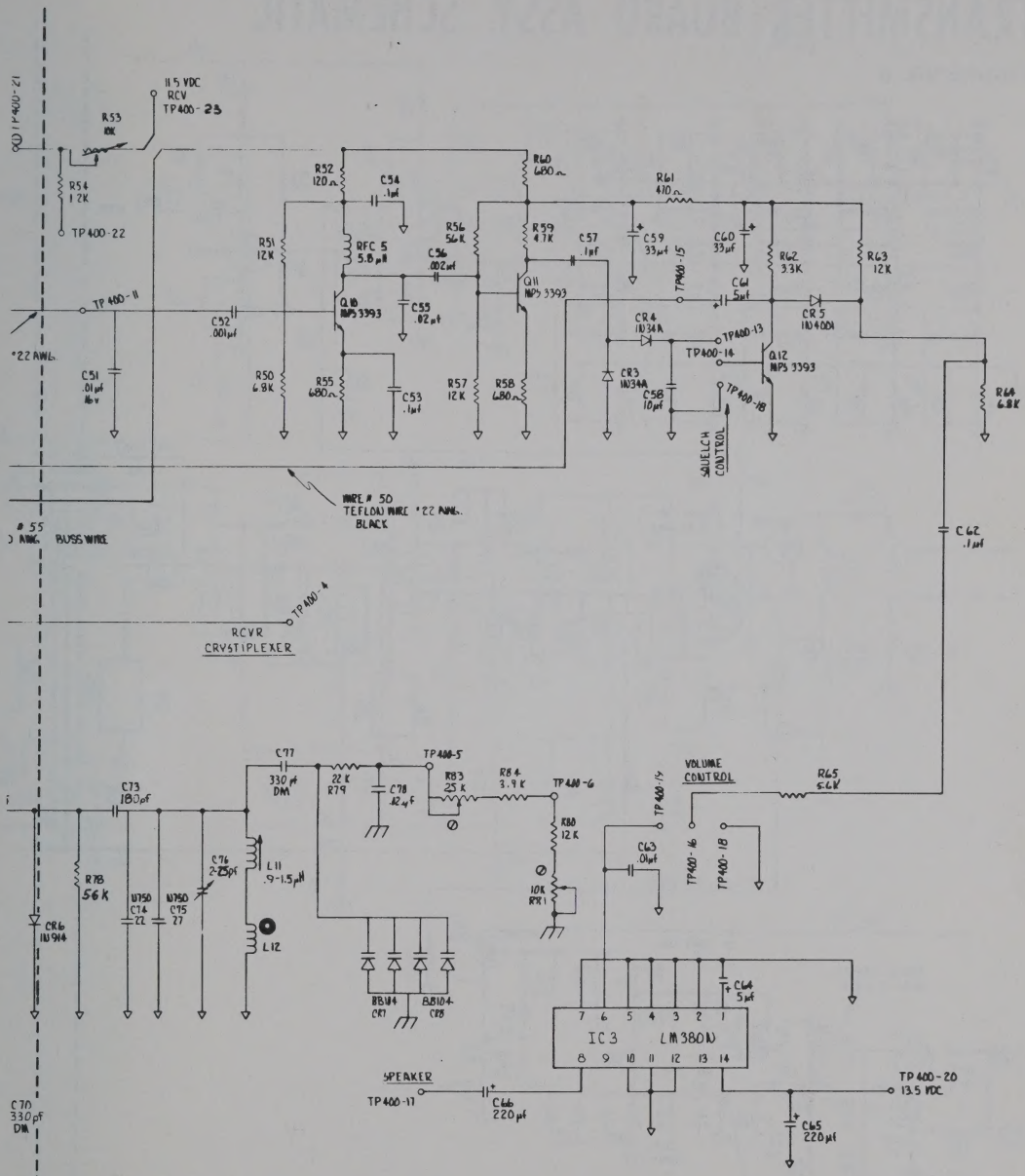



D
B
A
C
R30 120Ω
R29 22K
R28 68K
C30 .05μf
C36 .05μf
R34 120Ω
RFC 2 330μH
R35 1K
R37 68K
R27 1.2K
CB3 15pf
F1 5FC 4.5MA
R33 1.2K
RFC 1 820μH
C37 18pf
R36 22K
F3 CF5 455E
R26 82Ω
Q8 2N5245
R39 82Ω
Q6 40673
F2 5FC 4.5MA
Q9 40673
R22 82Ω
C29 .05μf
R31 1.2K
R32 1.2K
C35 .02μf
R38 1.2K
R40 1.2K
C38 .1μf
C28 6-25pf
C31 470pf
11.5 VDC RCV TP400-29
RFC 3 15μH
R18 180
C20 470pf
147 MHz SELECT TP400-2
C32 .001μf
L10
R25 8.2K
C79 .001μf
L9
R27 22K
Q7 2N3563
Q5 2N 3563
R20 33K
C21 27
R19 180
C22 100pf
XY2 Y2 117.000 MHz
C33 .001μf
R23 1K
R24 8.2K
C34 56 MMD pf
TP400-8
TP400-7
25 MHz FROM TX PCB

RECEIVER BOARD ASSY. SCHEMATIC

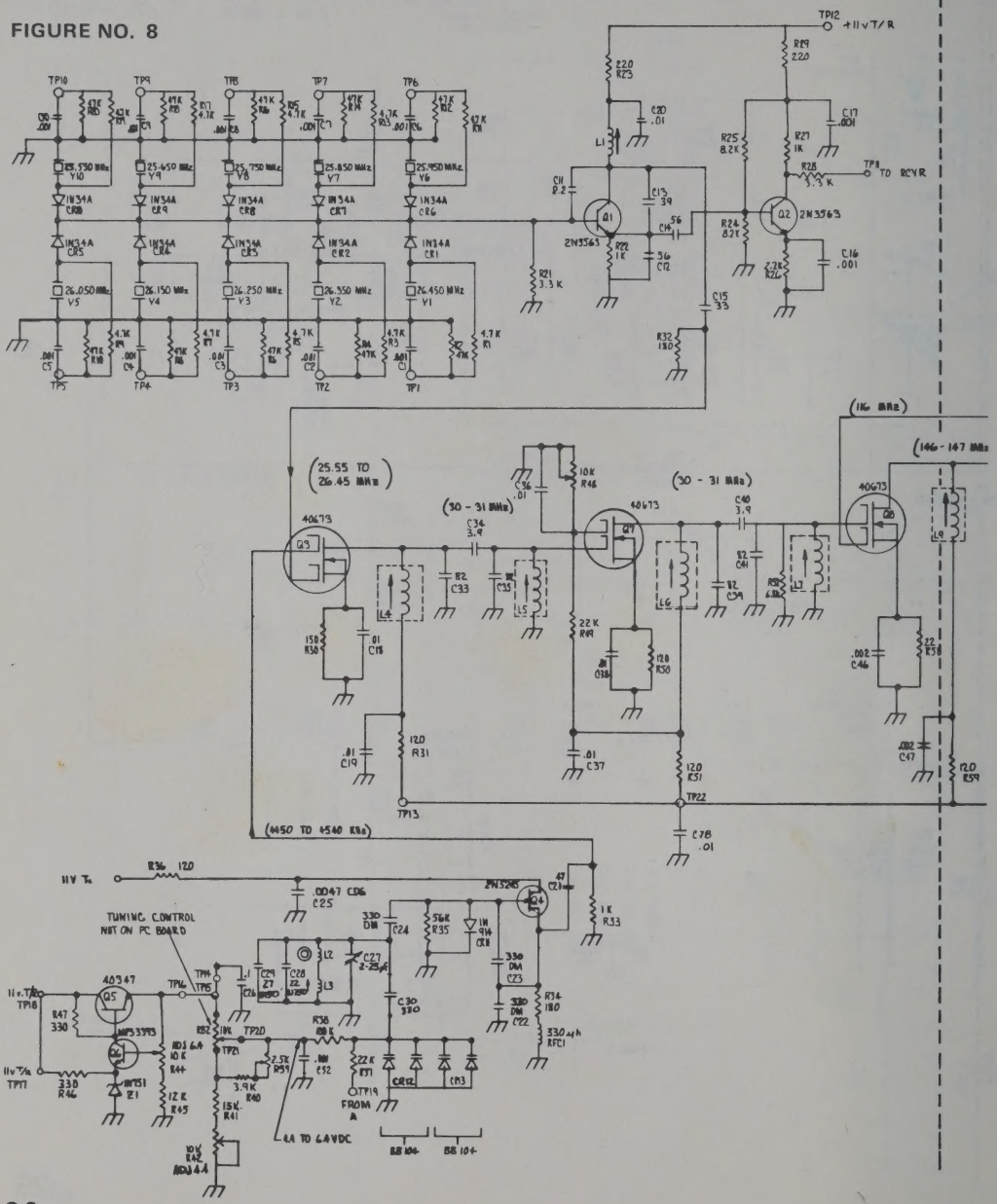
FIGURE NO. 7 **SHEET 2 OF 2**

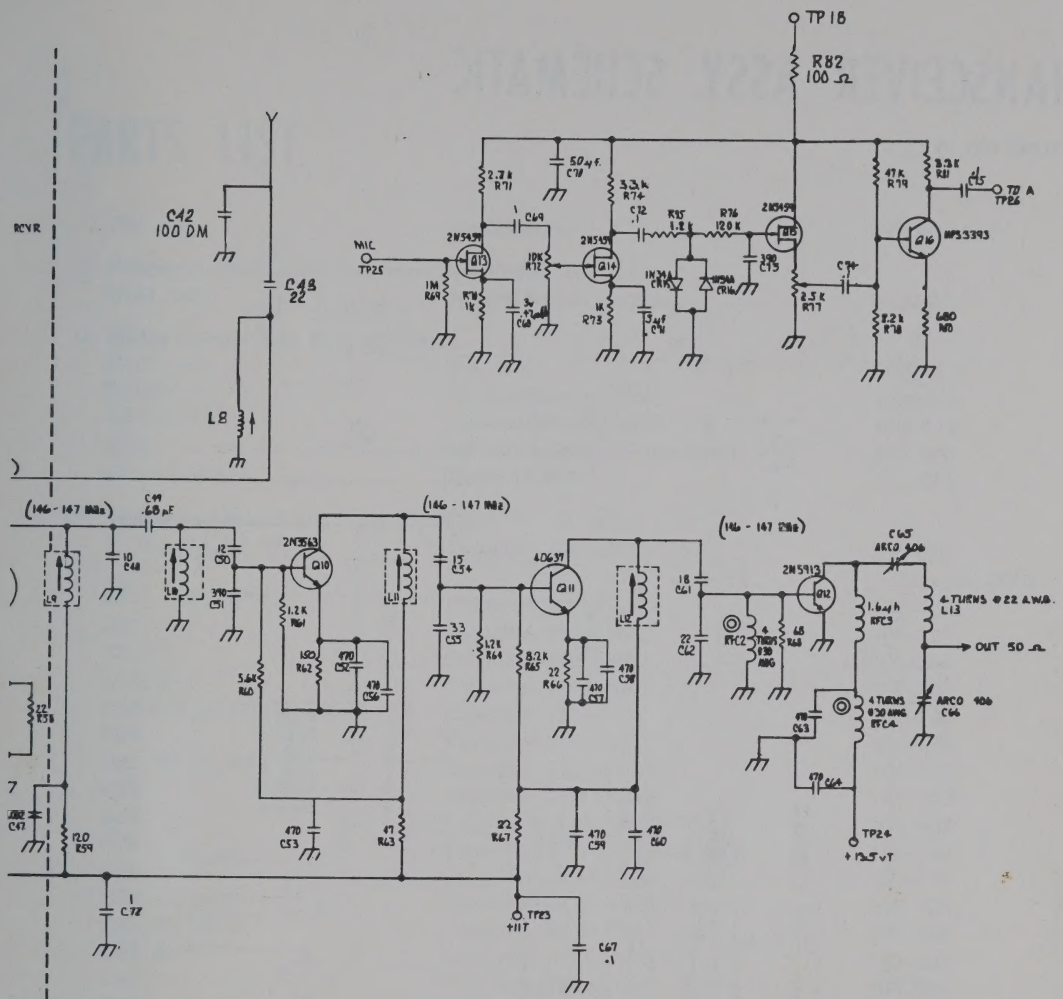



11.5 VDC
RCV
TP400-23
R53
10K
R54
1.2K
TP400-22
TP400-21
R52
120Ω
C54
.1μf
R60
680Ω
R61
470Ω
R56
56K
R59
4.7K
C57
.1μf
C59
33μf
C60
33μf
R62
3.3K
R63
12K
RFC 5
5.8μH
C56
.002μf
R51
12K
TP400-15
C61
5μf
TP400-11
Q10
MPS 3393
C55
.02μf
Q11
MPS 3393
CR5
1N4001
CR4
1N34A
TP400-13
TP400-14
Q12
MPS 3393
C52
.001μf
*22 AWG.
C51
.01μf
CR3
1N34A
C58
10pf
TP400-18
SQUELCH
CONTROL
R50
6.8K
R55
680Ω
C53
.1μf
R57
12K
R58
680Ω
R64
6.8K
WIRE # 50
TEFLON WIRE *22 AWG.
BLACK
55
AWG. BUSS WIRE
C62
.1μf
TP400-4
RCVR
CRYSTIPLEXER
C77
330pf
DM
22K
R79
TP400-5
C78
.02μf
R83
25K
R84
3.9K
TP400-6
C73
180pf
R80
12K
TP400-14
VOLUME
CONTROL
R65
5.6K
C63
.01μf
TP400-16
TP400-18
R78
56K
C74
2-25pf
L11
.9-1.5μH
10K
RX1
CR6
1N914
1N750
C14
22
1N750
C75
27
L12
BB104
CR7
BB104
CR8
C64
5μf
7 6 5 4 3 2 1
IC 3 LM 380(N)
8 9 10 11 12 13 14
SPEAKER
TP400-17
C66
220μf
TP400-20
13.5 VDC
C65
220μf
C70
330pf
DM

TRANSMITTER BOARD ASSY. SCHEMATIC

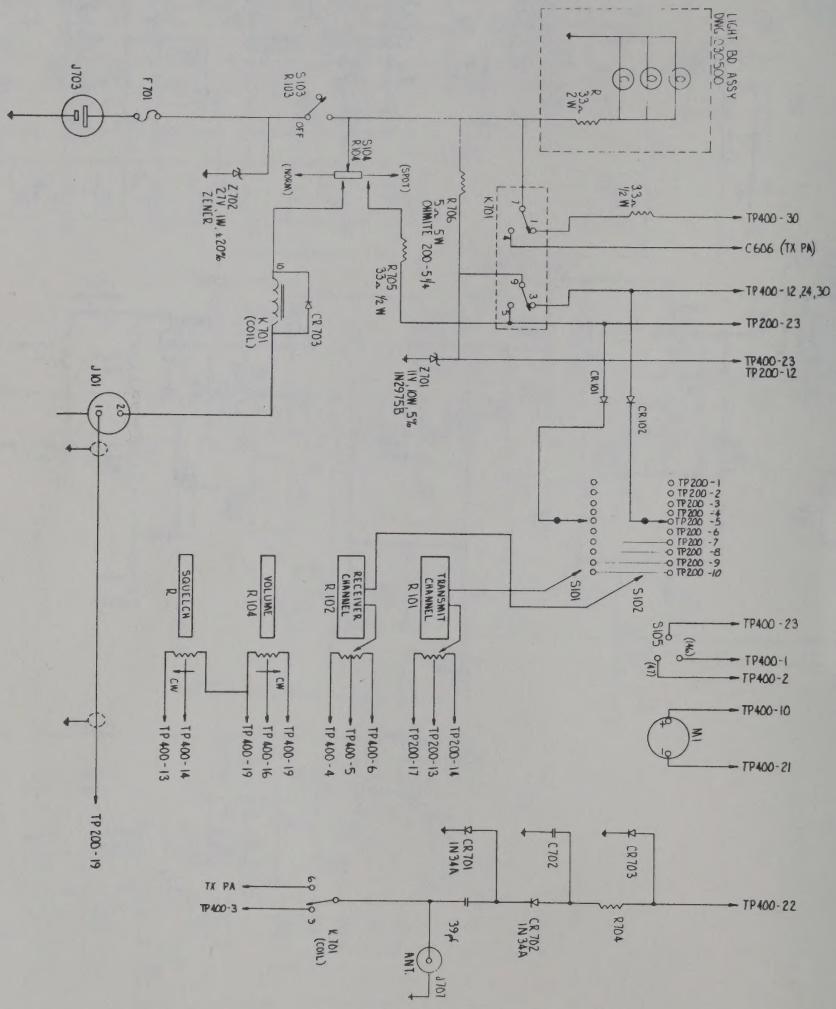
FIGURE NO. 8




TP18
R82
100 Ω
RCVR
C42
100 DM
C43
22
L8
MIC
TP25
2.7K R71
50μF C70
C69
3.3K R74
C72
R75 1.2K
R76 120K
2N5459 Q15
47K R79
3.3K R81
TO A TP26
2N5459 Q13
10K R72
2N5459 Q14
1M R69
R70 1K
3μF C68
1K R73
3μF C74
1N34A CR16
1N34A CR15
390 C75
C76
2.5K R77
MPS3393 Q16
2.2K R78
680 R80
(146 - 147 MHz)
C49 .68pF
L9
10 C48
L10
12 C50
390 C51
2N3563 Q10
1.2K R61
150 R62
470 C52
470 C56
5.6K R60
L11
15 C54
33 C55
47K R64
8.2K R65
22 R66
470 C58
L12
4.0637 Q11
470 C59
470 C60
22 R67
47 R63
470 C53
22 R58
470 C61
C47
R59
1 C72
TP23
+11T
C67 .1
(146 - 147 MHz)
18 C61
22 C62
2N5913 Q12
RFC2
4 TURNS #30 AWG
48 R68
C65 ARCO 406
1.64μh RFC3
4 TURNS @ 22 A.W.G. L13
OUT 50Ω
4 TURNS #30 AWG RFC4
ARCO 406 C66
470 C63
470 C64
TP24
+13.5VT

TRANSCEIVER ASSY. SCHEMATIC

FIGURE NO. 9



PARTS LIST

Ref. Des.	*Description*	*ISC Pt. No.*
I. Frequency Selector Harness Assy, Dwg #1030110		
S101, 102	Rotary Switch 2-12 pos.	272-007
II. Wiring Harness Assy. Dwg #0100111		
R101, 102	Pot, 10K	1030114
R103-S103	Squelch/on-off Control	1030113
R104-S104	Volume/SPOT Control	1030112
S105	Miniature Toggle Switch SPDT	283-005
CR101, 102	Diode 1N4001	145-002
III. Transmitter Board Assy. Dwg #0100250		
C1 thru 10, 16, 17, 32	Capacitor .001 μf Z5F	102-002 (Sub 101-009)
C11	Capacitor, 2.2 pf NPO	100-104
C12, 14	Capacitor, 56 pf NPO	100-121
C13	Capacitor, 39 pf NPO	100-040
C15, 55	Capacitor, 33 pf NPO	100-033
C18 thru 20, 36, 37, 38, 78	Capacitor, .01 μf	100-006
C21	Capacitor, 47 pf NPO	100-120
C22, 23, 24, 30	Capacitor, 330 pf DM	104-125
C25	Capacitor, .0047 COG	103-002
C26	Capacitor, .1 μf, 12V DISC	100-007
C27	Capacitor, 1.8-16.7 pf Air Trim	116-120
C28	Capacitor, 22 pf N750	100-712
C29	Capacitor, 27 pf N750	100-705
C33, 35, 39, 41	Capacitor, 82 pf Z5F	100-082
C34, 40	Capacitor, 3.9 pf NPO	100-005
C42	Capacitor, 100 pf DM	104-100
C43, 62	Capacitor, 22 pf NPO	100-116
C 52, 53, 56 thru 60 63, 64	Capacitor, 470 pf	102-032
C46. 47	Capacitor, .002 μf	101-011
C48	Capacitor, 10 pf NPO	100-012
C49	Capacitor, .68 GIM	100-002
C50	Capacitor, 12 pf NPO	100-113
C54	Capacitor, 15 pf NPO	100-114
C61	Capacitor, 18 pf NPO	100-115

Ref. Des.	*Description*	*ISC Pt. No.*
C56, 66	Capacitor, ARCO 406	116-014
C68	Capacitor, .47 μf @ 3V MAG	100-013
C69, 72, 74, 75, 66, 67	Capacitor, .1 μf, 12V	100-007
C70	Capacitor, 50 μf, 15V	107-005
C71	Capacitor, 5 μf, 15V	107-004
C51-73	Capacitor, 390 Z5V	102-095
L1	Inductor, Stanwyck .45-.75 (GRN)	182-044
L2	Inductor, Torrodial	0100212
L3	Inductor, Stanwyck (RED)	182-045
L4, 5, 6, 7	Inductor, P. Smith, 9½+/Wht.	182-051
L8, 9, 10, 11	Inductor, P. Smith, 3½+/Org.	152-048
L12	Inductor, P. Smith, 2½+/Purple	182-053
L13	Inductor,	182-057
Q1, 2, 10	Transistor, 2N3563	200-011
Q3, 7, 8	Transistor, 40673	200-002
Q4	Transistor, 2N5245	200-012
Q5	Transistor, 40347	200-008
Q6, 16	Transistor, MPS 3393	200-006
Q12	Transistor, 2N5913	200-017
Q13, 14, 15	Transistor, 2N5459	200-015
R1, 3, 5, 7, 9, 11, 13, 15, 17, 19	Resistor, 4.7K 1/4W	220-472
R2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 79	Resistor, 47K 1/4W	220-473
R21, 28, 74, 81	Resistor, 3.3K	220-332
R22, 27, 33, 70, 73	Resistor, 1K 1/4W	220-102
R23, 29	Resistor, 220 1/4W	220-221
R24, 25, 65, 78	Resistor, 8.2K 1/4W	220-822
R26	Resistor, 2.2K 1/4W	220-222
R30, 62	Resistor, 150 1/4W	220-151
R76	Resistor, 120K	220-124
R32, 34	Resistor, 180 1/4W	220-181
R35	Resistor, 56K	220-563
R36, 31, 50, 51, 59	Resistor, 120 1/4W	220-121
R37, 49	Resistor, 22K 1/4W	220-223
R38	Resistor, 100K 1/4W	220-104
R39, 77	Resistor, 2.5K POT P.C. MGT.	241-026

Ref. Des.	*Description*	*ISC Pt. No.*
R40	Resistor, 39K 1/4W	220-392
R61, 64, 75	Resistor, 1.2K	220-122
R41	Resistor, 15K 1/4W	220-153
R45	Resistor, 12K	220-123
R46, 47	Resistor, 330 1/4W	220-331
R52	Resistor, 6.8K 1/4W	220-682
R60	Resistor, 5.6K 1/4W	220-562
R68	Resistor, 68 1/4W	220-680
R69	Resistor, 1M 1/4W	220-105
R42, 44, 48, 72	Resistor, 10K P/C POT	241-027
Y1	Crystal, 26.450 MHz	252-060
Y2	Crystal, 26.350 MHz	252-059
Y3	Crystal, 26.250 MHz	252-058
Y4	Crystal, 26.150 MHz	252-057
Y5	Crystal, 26.050 MHz	252-056
Y6	Crystal, 25.950 MHz	252-055
Y7	Crystal, 25.850 MHz	252-054
Y8	Crystal, 25.750 MHz	252-053
Y9	Crystal, 25.650 MHz	252-052
Y10	Crystal, 25.550 MHz	252-051
Z1	Zener Diode, 1N751 5.1V	143-011
CR1 thru 10, 15, 16	Diode, 1N34A	141-001
CR11	Diode, 1N914	142-004
CR12, 13	Diode, BB-104 Varicap	144-001
RFC1	RF Choke, 330 μH	182-055
RFC2, 4	RF Choke	337-026
RFC3	RF Choke, 1.6 μH	190-034
Q11	Transistor, 40637	200-016
R63	Resistor, 47Ω 1/4W	220-470
R58, 66, 67	Resistor, 22	200-220
R71	Resistor, 2.7K 1/4W	200-272
R80	Resistor, 680 1/4W	220-681
C25	Capacitor, .0047 COG	103-003
IV. FM-27B Amplifier Assy. Dwg #1030300		
C601, 605	Capacitor, Disc. .02 μf Z5μ	102-056

Ref. Des.	*Description*	*ISC Pt. No.*
C602, 606	Capacitor, Feed Thru	106-005
C603, 604	Capacitor, MICA Trimmer	116-016
C607, 608, 609	Capacitor, MICA Trimmer	116-014
L601, 605	R.F. Choke	1030315
L602, 606	Coil, Air Wound 5 Turns 3/8" DIA.	182-042
L604	Coil, Air Wound 2 Turns 3/8" DIA.	182-041
L607	Coil, Air Wound 3 Turns 3/8" DIA.	1030316
Q601	PWR. Transistor	200-040
Q602	PWR. Transistor	200-041
R601	PWR. Amplifier Resistor	1030314
C610, 611	Capacitor, 5 μf Elec. 15V	107-004
L608	Inductor, 1/4" Copper Strap	500-051
V. FM-27B Receiver Board Assy. Dwg #0100450		
C34	Capacitor, 56 pf NPO	100-121
C11, 32, 33, 52, 68, 79, 81	Capacitor, .001 μf	102-002
C2, 4, 5, 14, 19, 20, 31	Capacitor, 470 pf NPO	102-032
C13, 29, 30, 36	Capacitor, .05 μf	102-100
C3, 35, 55, 78	Capacitor, .02 μf	102-094
C38 thru 44, 49, 50, 53, 54, 57, 62	Capacitor, .1 μf	100-007
C37	Capacitor, 18 pf NPO	100-115
C51, 63	Capacitor, 16V, ±20%, .01 μf RMCM-16 MAGNACAP	100-006
C61, 64, 80	Capacitor, Elec. 5 μf 15V	107-004
C12, 23, 45, 48, 56	Capacitor, .002 μf	101-011
C47, 73	Capacitor, 180 pf DM-15	104-180
C59, 60	Capacitor, Tantalum 33 μf, 10V Elec.	109-004
C58	Capacitor, Tant. 10 mf 10V	109-010
C65, 66	Capacitor, Elec. 220 μf 15V	107-030
C67	Capacitor, Elec. 910 pf	101-009
C69	Capacitor, 100 pf DM	104-100
C72	Capacitor, SM 4700 pf	103-002
C70, 71, 77	Capacitor, 330	104-125
C83	Capacitor, 15 pf NPO	100-116
C74	Capacitor, 27 pf N750	100-750
C75	Capacitor, N750 22 pf	100-712
C76	Capacitor, Trimmer 1-17 pf	116-120

Ref. Des.	*Description*	*ISC Pt. No.*
C24, 28	Capacitor, Trimmer 6–25 pf	116–115
C9	Capacitor, 3.3 pf NPO	100–108
C1	Capacitor, 5.6 pf NPO	100–109
C82	Capacitor, Elec. 50 μf 15V	107–005
C15, 16	Capacitor, 2.2 pf NPO	100–104
C10, 17, 21	Capacitor, 27 pf NPO	100–027
C18, 22	Capacitor, 100 pf	102–063
C7	Capacitor, .39 pf GIM.	100–001
C25	Capacitor, .68 pf GIM.	100–002
C6, 8	Capacitor, 8.2 pf NPO	100–111
C46	Capacitor, 1000 pf DM	104–001
C84, 85	Capacitor, Ceramic 220 pf Z5F	100–220
F1, 2	Filter, Ceramic SFC 4.5 MA	266–021
F3	Filter, Ceramic SFC 455 E	266–010
C83	Capacitor, 15 pf DM	100–114
L10, 11	Coil, Stanwyck (Red)	182–045
L6	Inductor, Toroid (19^+ of #28 AWG)	0100411
L4	Inductor, Toroid Blue (15^+ of #22 AWG)	0100412
L1	Inductor, Air Wound (5^+ of #22 AWG)	182–042
L7, 8, 9	Inductor, P. Smith (Purple) .04–.06 μH	182–053
L2, 3	Inductor, P. Smith (Orange)	182–048
L13	Coil, Discriminator	182–040
L12	Inductor, Toroidal (40^+ of 30 AWG)	0100413
Q1, 2, 6, 9	Semiconductor, RAC 40673	200–002
Q3, 4, 5, 7, 13	Semiconductor, MOT 2N3563	200–011
Q8, 14	Semiconductor, T.I. 2N5245	200–012
Q10, 11, 12	Semiconductor, MOT MPS3393	200–006
Q15	Transistor, RAC 40347	200–008
Q16	Semiconductor, MOT MPS3394	200–103
R23, 35, 70	Resistor, 1KΩ 1/4W	220–102
R11, 14, 24, 25, 68, 69	Resistor, 8.2K 1/4W	220–822
R5, 17, 21, 29, 47, 79, 36	Resistor, 22K 1/4W	220–223
R3, 28, 37	Resistor, 68K 1/4W	220–683
R9, 30, 34, 52, 66	Resistor, 120Ω 1/4W	220–121
R27, 31, 32, 33, 38, 40	Resistor, 1.2K 1/4W	220–122
R1, 22, 26, 39	Resistor, 82Ω 1/4W	220–820
R2, 6	Resistor, 33K 1/4W	220–333
R43	Resistor, 1.5K 1/4W	220–152

Ref. Des.	*Description*	*ISC Pt. No.*
R41, 44	Resistor, 47Ω 1/4W	220-470
R42	Resistor, 150Ω 1/4W	220-151
R45, 46, 48, 50, 64	Resistor, 6.8K 1/4W	220-682
R81, 74	Resistor, 10K POT MURATA	241-027
R53	Resistor, P.C. Mount POT 10K	240-028
R51, 57, 63, 80	Resistor, 12K 1/4W	220-123
R10, 55, 58, 60, 82	Resistor, 680 1/4W	220-681
R56, 78	Resistor, 56K 1/4W	220-563
R59, 85	Resistor, 4.7K 1/4W	220-472
R13, 61, 67	Resistor, 470Ω 1/4W	220-471
R16, 20, 62	Resistor, 3.3K 1/4W	220-332
R76, 77	Resistor, 330Ω 1/4W	220-331
R71	Resistor, 2.7K 1/4W	220-272
R49	Resistor, 15K	220-153
R4, 7, 12, 15, 18, 19	Resistor, 180Ω 1/4W	220-181
R8	Resistor, 820Ω 1/4W	220-821
T1	Transformer, I.F.	602-009
Y1	Crystal, 116 MHz	251-017
Y2	Crystal, 117 MHz	251-018
Z1	Zener Diode, 9.1V 400 min 1N960	140-000
Z2	Zener Diode, 1N751A	143-011
CR1, 2, 3, 4, 9	Diode, 1N34A	141-001
CR5	Diode, 1N4001	145-002
CR6	Diode, 1N914	142-004
CR7, 8	Diode, BB-104 Varicap	141-001 141-016
IC1	Integrated Circuit, RCA CA3076	201-007
IC2	Integrated Circuit, RCA CA3075	201-003
IC3	Integrated Circuit, NSC LM380	201-010
RFC1	R.F. Choke, 820 μH	190-033
RFC2, 4	R.F. Choke, 330 μH	182-055
RFC3	R.F. Choke, 15 μH	190-032
RFC5	R.F. Choke, 5.8 μH	190-018
R65	Resistor, 5.6K 1/4W	220-562
R83	Resistor, 2.5K P.C. MGT. POT	241-026
R84	Resistor, 3.9K 1/4W	220-392
R54	Resistor, 1.2K 1/4W	220-122

Ref. Des.	*Description*	*ISC Pt. No.*
VI. Light Mounting Board Assy. Dwg #1030500		
R1	Resistor, 33 2W	227-330
VII. Rear Panel Assy. Dwg #0100700		
K701	Relay, T/R 3 PDT	172-004
XF701	Fuseholder, 3AG	161-001
* Z701	Zener Diode, 1N29753	143-002
Z702	Zener Diode, 75V	143-006
CR701, 702, 704	Diode, 1N34A	141-001
CR703	Diode, 1N4001	145-002
R701	Resistor, 33Ω 1/2W	223-330
* R702 (R-706)	Resistor, 5Ω 5W	232-001
C701	Capacitor, Disc. .02 μf ±20% Z5U	102-056
C702	Capacitor, Composition .39 pf	100-001
R703	Resistor, 18K 10% 1/4W	220-183
TB701	Terminal Strip (4 pos)	335-006

NOTES: